



ROBOTICS UPDATE

"Providing network-integrated robotic solutions for C4ISR applications."

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NATIBO Steering Committee



Bart Everett, Technical Director for Robotics, recounts the Center's 25-year history in unmanned systems to the NATIBO Steering Group.

On 20 June, in conjunction with the North American Technology and Industrial Base (NATIBO) Steering Committee meeting, SSC San Diego performed a series of demonstrations highlighting the latest technological advances in unmanned autonomous systems.

NATIBO is chartered to promote a cost-effective robust technology/industrial base that is responsive to the national and economic security needs of the US and Canada. The criteria used for selecting technologies to study through this program are: (1) the candidate is a key technology of high interest, (2) there is potential for broad military and commercial application, (3) development and/or production exists in both the US and Canada, and (4) there is a good window of opportunity for investment and application.

Numerous unmanned-systems technologies were featured during the demonstrations. The Multi-robot Operator Control Unit (MOCU) command-and-control software, designed to oversee multiple autonomous assets across various domains (air, land, and sea) was shown controlling the Urban Robot (URBOT) and the Unmanned Surface Vehicle (USV). The attendees learned of MOCU's modular architecture that scales to any vehicle's requirements (i.e., map module, communication protocol, mission planner) and human-interface needs (i.e., gauges, maps, video).

The visitors also observed autonomous bunker search and mapping operations of the All Terrain Robotic Vehicle (ATRV) surrogate testbed in Battery Woodward. Using



Mike Bruch demonstrates MOCU control of a UGV and a USV to John Neri (left), Cynthia Gonsalves (center) and Leo Plonsky (right).

Army Science Board Visit

Members of the Army Science Board (ASB) Unmanned Systems Technology Panel visited SSC San Diego on 14 July. The panel is charged with completing a comprehensive Unmanned Systems Integration Plan (Air/Ground) that includes robotic and unmanned-systems technology options available for spinout to both maneuver and multifunctional brigades. The focus is on near-term opportunities for the Army's Modular Force, with an emphasis on ground robotics. The team arrived at SSC San Diego with the objective of identifying specific ground-robotic efforts that could be accelerated for fielding, as well as supporting technologies that could be exploited for ground robotics in general.

Several candidate systems most closely aligned with this objective were demonstrated. The MDARS-E robots were observed performing autonomous security patrols. Results



Major John Andrews (occluded) discusses the spiral-development accomplishments of the Robotic Systems Pool in response to user needs.

of the Early User Assessment at Hawthorne Army Depot were highlighted, along with add-on capabilities for lethal/non-lethal weapon payloads, marsupial delivery of man-portable UGVs, and UAV launch/recovery/refuel operations.

Another key contender was the Autonomous Robotic Mapping System (ARMS) prototype (implemented on an iRobot ATRV), which was demonstrated in the underground bunker complex of Battery Woodward. Using SLAM algorithms

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Aaron Burmeister (center left) demonstrates the automated UAV refueling capability of the AUMS mission module.

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Estrellina Pacis (right) briefs the Autonomous Robotic Mapping System to (left to right) John Neri, John Todaro, Cynthia Gonsalves, Major Robert Boucher, and Andrew Gale.

simultaneous localization and mapping (SLAM) capabilities, the ATRV autonomously explored and mapped the interior of the bunker. The system then uploaded the resulting virtual world model of the structure, fused with icons depicting items of tactical interest, to the operator interface.

The Mobile Detection Assessment Response System Exterior (MDARS-E), sponsored by PM-FPS, was demonstrated in the Robotic Operations Command Center (ROCC). The MDARS-E robots performed autonomous outdoor security operations highlighting the ability to simultaneously control multiple unmanned resources. The NATIBO visitors also received briefings and demonstrations on the Family of Integrated Rapid Response Equip-

ment (FIRRE), the Robotic Systems Pool, and various Code 274 projects in autonomous unmanned underwater vehicles (UUVs).

On 21 June, further discussions were held with the NATIBO Steering Committee to address technology and industrial-base issues associated with unmanned systems. As a result of this exchange, NATIBO will explore the establishment of a working group to complete a sector study on unmanned systems. The primary purpose of this study will be to assess the viability of the unmanned systems sector, identify related issues and barriers, and develop strategies to enhance and sustain the health of the marketplace. ♦



Larry Drymon (center right) explains the *MetalStorm* weapon payload mounted on the MDARS BAA prototype.

developed by SRI, the ATRV autonomously mapped and searched the interior of the underground structure. The ability of the system to construct a virtual world model, identify items of tactical significance, and interact through a natural-language interface was of particular interest to the panel members. As a consequence, this technology area was singled out as offering immediate transition potential to fielded man-portable UGVs.

The panel also requested a copy of an ongoing human-robot interaction study being conducted at SSC San Diego by Katherine Birchmore, a cognitive science student at the University of California San Diego, sponsored by the

Operator Control Unit command-and-control software, and the Robotics Systems Pool support to the Global War on Terror. The autonomous UUV work ongoing in Code 274 was also identified as a key technology area offering noteworthy leverage opportunities with ground robotics.

The panel's findings and recommendations were briefed to the Army's senior leadership on 20 July, and the final report should be available by the end of September. A more in-depth ASB study of robotics is expected to kick off in FY-07. SSC San Diego has offered to provide technical advisors to support any future unmanned system studies by the Army. ♦



Army Science Board members inspect the hardware associated with the ARMS prototype as it explores and maps Battery Woodward.

Naval Research Enterprise Intern Program. The purpose of this study is to establish performance metrics that compare the efficiency and effectiveness of a teleoperated man-portable robot in a bunker search-and-map scenario, relative to a human entering the same bunker with a flashlight and a clipboard. Follow-on trials will then rank the autonomous search-and-map functionality of the ARMS system against these two baselines.

Additional discussion showcased the Multi-robot

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